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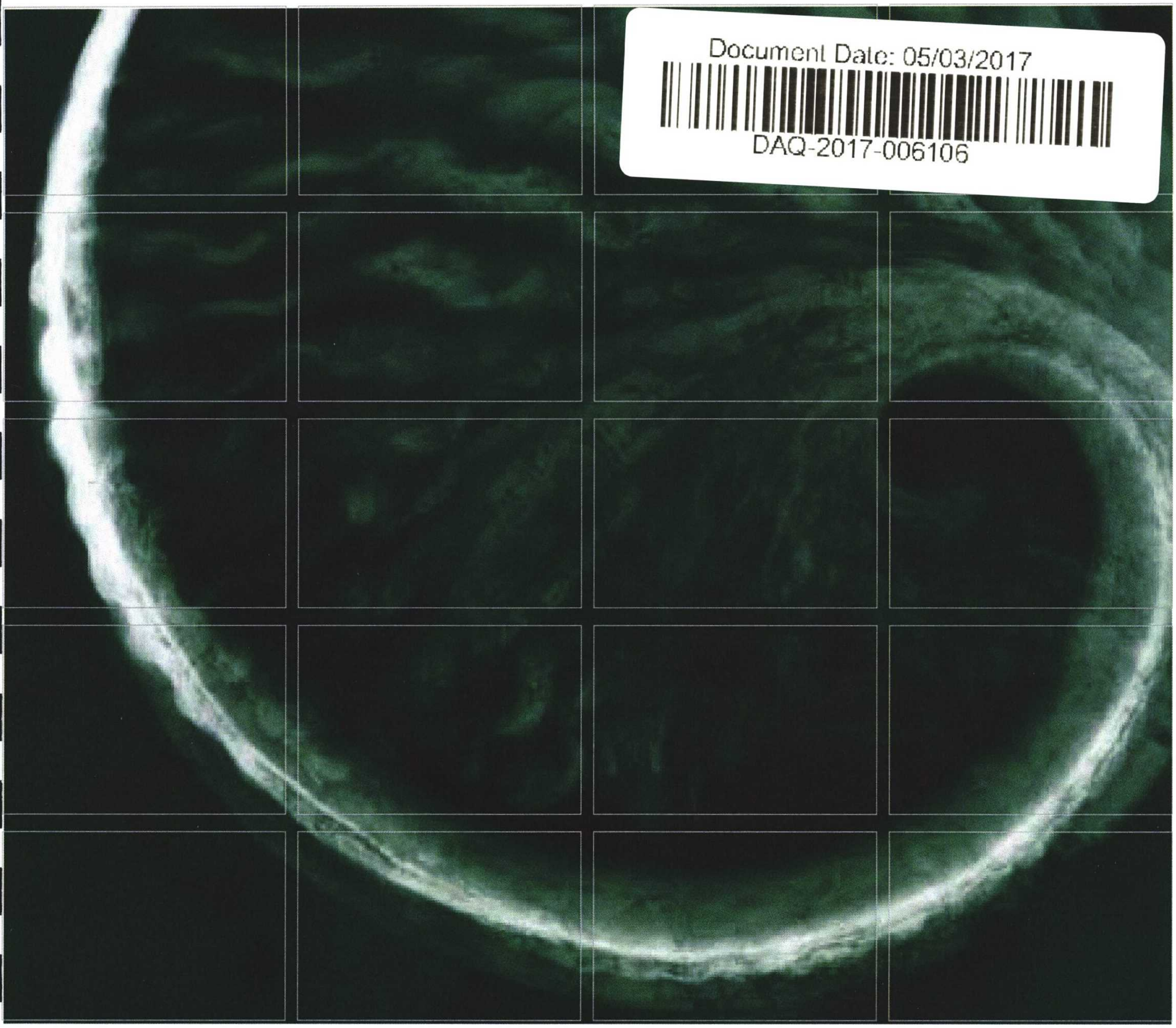

NUCOR

Best Available Control Technology Evaluation – Utah $PM_{2.5}$ State Implementation Plan

Brigham City, Utah

UTAH DEPARTMENT OF
ENVIRONMENTAL QUALITY

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DIVISION OF AIR QUALITY

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Prepared for:
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Vulcraft, A Division of Nucor Corporation

Best Available Control Technology Evaluation Utah $PM_{2.5}$ State Implementation Plan

Brigham City, Utah

April 2017

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LIST OF ACRONYMS

AMPs	amperes
ANSI	American National Standard Institute
ASHAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology

BMP	best management practices
cfm	cubic feet per minute
EPA	Environmental Protection Agency
ERM	ERM-West, Inc.
ESP	electrostatic precipitator
EU	emission unit (air pollution producing equipment)
FGR	flue gas recirculation
HVLP	high volume low pressure
LAER	lowest achievable emission rate
lb/gal	pounds per gallon
LEL	lower explosive limit
N	no
N/A	not applicable
NBS	Nucor Building Systems
NAAQS	National Ambient Air Quality Standards
NG	natural gas
NH_3	ammonia
NOI	Notice of Intent
NOx	nitrogen oxides
NSCR	non-selective catalytic reduction
ppm	parts per million
PTE	Potential to Emit
RACT	Reasonably Available Control Technology
RBLC	RACT/BACT/LAER Clearinghouse
SBAPCD	Santa Barbara Air Pollution Control District
SCAQMD	South Coast Air Quality Management District
SCR	selective catalytic reduction
SIC	standard industrial classification
SIP	State Implementation Plan
SNCR	selective non-catalytic reduction
SOx	sulfur oxides

TO	Thermal oxidation
tpy	tons per year
VOC	volatile organic compounds
WGS	wet gas scrubber
Y	yes

EXECUTIVE SUMMARY

This Best Available Control Technology (BACT) Evaluation was completed in accordance with the Utah Department of Air Quality's 23 January 2017 letter requesting this analysis as part of the regulatory agency's fine particular matter (particulate matter 2.5 microns or less in diameter or $PM_{2.5}$) Serious Nonattainment State Implementation Plan (SIP) development process. The top-down BACT process was followed to identify BACT for each source and the following associated emission type: $PM_{2.5}$, sulfur oxides (SOx), nitrogen oxides (NOx), volatile organic compounds (VOC), and ammonia (NH_3).

Vulcraft, a Division of Nucor Corporation (Nucor-Vulcraft) is a steel fabrication facility that consists of two main facilities, including the Joist Plant and Nucor Building Systems (NBS). The Joist Plant consists of the Joist Plant, the Cold Finish area, a stock yard, the maintenance facility and administrative buildings. Nucor-Vulcraft is identified as a Major Source for Volatile Organic Compounds (VOCs), which are considered $PM_{2.5}$ precursors.

The applicable sources at the Nucor-Vulcraft facility were identified as: shot blasting, exhaust vents, plasma cutters, spray boxes, welding, spray booths, drying ovens, dip coating, haul roads, resistance welding, joist coating, parts cleaners, vacu- coater, mastic equipment, and lubrication equipment.

All potential control technologies were listed and evaluated for the relevant emission sources. Technically infeasible technologies were eliminated. The remaining technologies were ranked by control effectiveness. An economic feasibility study was then conducted with a cost effectiveness threshold of $10,000 per ton removed per year. As a part of the BACT process, other issues that could adversely impact the environment, safety and health, and energy demand were included in the evaluation. Table 1 lists controls identified as BACT for the applicable emission sources.

Nucor-Vulcraft has significantly reduced VOC emissions during the last 15 years by implementing the use of lower VOC paints (i.e. water based paints). Since 2005, VOC emissions at the facility have been reduced, mainly from painting operations, from 339 tons to 262 tons per year (tpy). The use of low-VOC paints represents the current baseline condition, and is considered BACT for the facility for painting operations. Nucor-Vulcraft experienced an average increase of $4 per gallon to use the low-VOC paint compared to the prior VOC-based paints, which results in an additional annual cost of about $900,000 per year based on the average annual quantities of paint used (i.e., 225,500 gallons).

In addition, Nucor-Vulcraft proposes to reevaluate welding techniques and plasma cutter operations, to confirm if techniques are optimal to ensure that emissions are minimized.

1.0 INTRODUCTION

On behalf of Vulcraft, a Division of Nucor Corporation (Nucor-Vulcraft), ERM-West, Inc. (ERM) conducted a Best Available Control Technologies (BACT) evaluation for the company's Brigham City facility. This report presents the BACT process and results for submittal to the Utah Department of Environmental Quality, Division of Air Quality (UDAQ). The BACT evaluation was completed in accordance with the UDAQ's 23 January 2017 letter requesting this analysis as part of the regulatory agency's fine particular matter (particulate matter 2.5 microns or less in diameter or $PM_{2.5}$) Serious Nonattainment State Implementation Plan (SIP) development process.

2.0 APPROACH

A top-down BACT analysis was completed for all technologies that would reduce $PM_{2.5}$ emissions and precursors of $PM_{2.5}$ emissions from all regulated sources within the Nucor-Vulcraft facility. The evaluation included assessing all processes from the Cold Finish, Joist Plant, Nucor Building Systems (NBS), and the new Grating and Structural Products lines. All applicable emission control technologies were identified for the emission sources, and they were screened for technical feasibility under the SIP requirements and schedule.

The SIP is designed to regulate and limit $PM_{2.5}$ and its precursors to below the National Ambient Air Quality Standards (NAAQS) based on data to be collected throughout year 2019. This means that control technology improvements will need to be in place before the end of year 2018 to support compliance with the SIP. Therefore, the evaluation and identification of BACT takes into account whether Nucor-Vulcraft can implement the new controls prior to the end of 2018.

In cases where Nucor-Vulcraft has determined that control technologies are technically feasible, except for the SIP schedule constraints, these controls are not considered BACT, but rather "Additional Feasible Measures" that could be implemented if more time were available. All technologies considered technically feasible as BACT or Additional Feasible Measures were ranked based on their potential emission reduction efficiencies. Energy, environmental, economic impacts and other considerations were evaluated for the feasible technologies; and the most effective, least impactful, cost-effective technologies were identified as BACT or Additional Feasible Measures for the applicable emission units.

2.1 BACT ANALYSIS PROCESS

The BACT analysis was organized into the following steps, which are described in the paragraphs that follow:

1. Identify control technologies.
2. Eliminate technically infeasible technologies.
3. Rank technologies by control effectiveness.
4. Evaluate controls for economic feasibility.
5. Recommend BACT.

2.1.1 Step 1 - Identify Control Technologies

Nucor-Vulcraft identified its emission sources for $PM_{2.5}$ and precursors; and then identified acceptable control technologies for these sources. The U.S. Environmental Protection Agency (EPA) established the Reasonable Available Control Technologies/BACT/Lowest Achievable Emission Rate (RACT/BACT/LAER) Clearinghouse (RBLC) to provide a central data base of air pollution technology information. Nucor-Vulcraft relied on the RBLC, plus other resources listed in Section 2.2, to identify potentially applicable control technologies. The emission sources and applicable technologies were documented using a BACT Matrix Table for tracking and presentation of the results as presented in Section 3 and the attached tables.

2.1.2 Step 2 - Eliminate Technically Infeasible Technologies

Nucor-Vulcraft reviewed the technologies to determine whether they were technically feasible based on site-specific (i.e., real estate) or operational constraints. The SIP time constraints were also taken into account relative to defining technically feasible BACT. Step 3 - Rank Technologies by Control Effectiveness

In most cases, Nucor-Vulcraft conservatively calculated the baseline emissions from its sources using the potential to emit (PTE) calculations used for the Notice of Intent (NOI) submitted 9 February 2017. In select cases, the actual emissions were considered from recent years (e.g., Purlin Line) instead of the PTE calculated values to more accurately account for potential emission reductions. The potential for additional emission reductions was evaluated for the applicable technologies using vendor or EPA provided removal efficiencies. The amount of emissions reductions that could be achieved for the applicable technologies were calculated and the technologies were listed according to rank on the BACT Matrix.

2.1.3 *Step 4 - Evaluate Controls for Economic Feasibility*

Nucor-Vulcraft evaluated the controls for economic feasibility using capital and operating cost estimates provided by the EPA Cost Control Manual, vendor information, ERM experience, and potential project estimates from Nucor-Vulcraft. Energy consumption, environmental and other impacts were considered for the feasible controls to account for all economic impacts. The economic feasibility of increased controls was evaluated using the ratio of the cost for the new controls compared with the incremental emission reductions achieved by the new controls verses the baseline (current) condition in terms of dollars per ton of emissions reduced. Nucor-Vulcraft considered the ratio of $10,000 per ton of emission reductions to represent economically feasible controls.

2.1.4 *Step 5 - Recommend BACT*

Based on the evaluation of control technologies, Nucor-Vulcraft is presenting in this report its analysis and conclusions regarding the controls it believes are technically and economically feasible, and those that can be considered BACT (including compliance with the UDAQ SIP schedule) or Additional Feasible Measures (if more time is permissible for technology implementation). Table 1 presents a summary of BACT selections for each pollutant by source.

2.2 *REGULATORY BACKGROUND*

The following BACT clearinghouses and guidelines were searched as part of Step 1 to identify potentially applicable control technologies for the Nucor-Vulcraft emission sources:

- U.S. EPA RACT/BACT/Lear Clearinghouse (RBLC)
- California Air Resources Board Standard Industrial Classification (SIC) 325180 (other basic inorganic chemical manufacturing) and 2812 (Alkaline and Chlorine)
- Bay Area Air Quality Management District (BAAQMD)
- South Coast Air Quality Management District (SCAQMD)
- Texas Commission of Environmental Quality

The following process types were reviewed for the various operations that are conducted at Nucor-Vulcraft:

- Process Type No. 12.310- Natural Gas -Paint, Heaters, Ovens

- Process Type No. 13.310 - Commercial/Institutional Size Boilers/ Furnace, <100 MMBtu/hr, Natural Gas
- Process Type No. 41.002 - Automobiles and Trucks Surface Coating -Guidecoat and Topcoat Painting
- Process Type No.41.013 - Miscellaneous Metal Parts & Product Surface Coating
- Process Type No. 81.230 - Steel Production Casting & Pouring Processes;
- Process Type No. 81.350 - Steel Foundry Casting & Pouring Processes;
- Process Type No. 81.390 - Other Steel Foundry Processes;
- Process Type No. 81.290 - Other Steel Manufacturing Processes;
- Process Type No. 81.370 - Miscellaneous Melt Shop Operations;
- Process Type No. 99.012- Welding & Grinding
- Process Type No. 99.999 - Other Miscellaneous Sources -Painting Operations

The following regulations were reviewed:

- Code of Federal Regulations Title 40, Part 52
- Code of Federal Regulations Title 40, Part 60
- Code of Federal Regulations Title 40, Part 63
- Utah Air Rules Title 19, Chapter 2 of the Utah Code: R307

To fully evaluate applicable BACT limits for processes with limited RBLC results, based on process type queries, additional RBLC queries were conducted based on process names or key words (e.g., "Blast").

2.3 *BASIS AND STUDY LIMITATION*

Operations were evaluated on a standalone bases per specific emission unit. The prescribed BACT process was followed including further investigation if a control technology appeared feasible, but not economically practical. Costs for these technologies, including implementation costs, were estimated using available regulatory data, vendor information, and best judgement; however, costs for major capital projects like those considered herein can vary by over 100 percent.

The cost effectiveness for BACT was considered at $10,000 per ton removed or less. Nucor-Vulcraft used this value as the basis for determining new BACT selections for this evaluation. The determination of technical feasibility had several criteria that needed to be met such as physical constraints, operational safety, and other environmental protection criteria.

3.0 *BACT EVALUATION*

The BACT Evaluation is summarized for each source in the following sections. Tables 2 through 6 also present the emission sources for direct $PM_{2.5}$ and its precursors (e.g., sulfur oxides (SOx), nitrogen oxides (NOx), volatile organic compounds (VOCs), and ammonia (NH_3)). For each source, these tables list the identified control technologies, if they are technically feasible, the baseline emissions, the estimated emissions reductions, and the cost effectiveness for applicable technologies.

3.1 *WIRE LINE SHOT BLASTING*

3.1.1 PM2.5

Shot blasting on the wire line produces Direct $PM_{2.5}$ emissions. The identified control technologies are listed on Table 2, including the currently implemented use of a baghouse with 99.99% efficiency.

The technical feasibility evaluation showed that no additional control technologies were feasible for the Wire Line Shot Blasting.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for the Wire Line Shot Blasting is considered to be the current controls: baghouse with 99.99% efficiency.

3.2 *COIL LINE SHOT BLASTING*

3.2.1 PM2.5

Shot blasting is done on the coil line with possible direct $PM_{2.5}$ emissions. No specific emission factor for $PM_{2.5}$ has been developed for shot blasting and with the absences of combustion in this process, the likelihood of measurable $PM_{2.5}$ being generated is small. Estimated PTE $PM_{2.5}$ emissions equal PM10 emissions, which are 3.3 tons per year (tpy). The identified control technologies are listed on Table 2, including the currently implemented use of a baghouse with 98% efficiency.

The technical feasibility evaluation showed an additional control technology of using a different baghouse filter media which has a removal efficiency of 99.99% down to 0.5 um. Based on limited emission factor data, this could reduce the PTE impact by 1.81 tpy.

The economic evaluation showed that this control technology was economically infeasible as the incremental cost effectiveness ratio exceeded $10,000 per ton. One main reason for this exceedance is because the higher efficiency filter media is not available for the current baghouse used at the facility, and full replacement of the existing baghouse would be required. Therefore, BACT for the Coil Line Shot Blasting is considered to be the current control: baghouse with 98% efficiency.

3.3 *BAR LINE SHOT BLASTING*

3.3.1 $PM_{2.5}$

Installation of the 99.99% removal efficiency filter media presented in Section 3.2.1 could result in an "on-paper reduction" of 5.29 tpy of $PM_{2.5}$ for this source. For the technical and economic discussion for this emission unit, please see Section 3.2.1. BACT for the Bar Line Shot Blasting is considered to be the current control: baghouse with 98% efficiency.

3.4 *EXHAUST VENTS (JOIST PLANT, COLD FINISH, AND NBS)*

3.4.1 $PM_{2.5}$

There are 15 roof vents on the Joist Plant, three (3) roof vents on Cold Finish and six (6) main vents on NBS (24 total roof vents). These fan-driven vents exhaust air from the respective production/assembly lines to the atmosphere. As recommended by the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHAE), 10 to 15 air exchanges per hour should occur for manufacturing buildings.

Approximately 2.16 tpy of $PM_{2.5}$ based on air sampling events, have been estimated to be exhausted from the 24 roof vents. The combined air flow, based on Approved American National Standard Institute (ANSI) is approximately 300,000 cubic feet per minute (cfm) or about 19,700 cfm per exhaust vent.

Control technologies for $PM_{2.5}$ appear to be limited to fabric filters, with filter bags that remove 99% of $PM_{2.5}$ (Table 2). This technology would involve 15 fabric filters having high volume, high efficiency filters or one large unit with extensive ducting and exhaust fans. Removal of small particulate, high volume air presents several known technical problems. Roof exhaust vents would have to be retrofitted with support structures for on-roof baghouses. Additional structural additions would also need to be made to facilitate servicing the equipment. An alternative approach would be for an extensive duct system to collect and move the exhaust building air down to a centralized baghouse system.

Due to the high volume of air flow that must be maintained, low volume of $PM_{2.5}$ to be removed, extensive structural improvements, and the number of fabric filter housings needed, this technology is neither technologically nor economically feasible.

3.5 *PLASMA CUTTER (COLD FINISH - DRY)*

The Plasma Cutter in Cold Finish produces direct $PM_{2.5}$ emissions and NOx emissions. This source has historically been operated less than 40 hours per year. There is no anticipated increased usage planned for this source.

3.5.1 $PM_{2.5}$

Dry plasma cutter operation in Cold Finish for maintenance produces approximately 0.035 tpy of Direct $PM_{2.5}$ emissions. The identified control technologies are listed on Table 2.

As estimated, with a maximum of 40 hours of operation, only 0.035 tpy are emitted from this unit, no additional controls were identified to be technically feasible. Therefore, BACT for the dry plasma cutter in Cold Finish is considered to be the current controls: limited use and best management practices.

3.5.2 NOx

The dry plasma cutter in Cold Finish produces 0.03 tpy of NOx emissions. The identified control technologies are listed on Table 4.

The technical feasibility evaluation showed one potential additional control technology: flex duct capture system with an ESP or fume collector. However, this is considered economically infeasible due to the limited operation of the dry plasma cutter, which results in insignificant emissions. Therefore, BACT for the dry plasma cutter in Cold Finish is considered to be the current controls: limited use and best management practices.

3.6 *PLASMA CUTTER (NBS - WET)*

3.6.1 $PM_{2.5}$

Nucor-Vulcraft operates a wet plasma cutter at NBS. This source reports emissions of Direct $PM_{2.5}$ although no specific emission factors are available for this operation, thus $PM_{2.5}$ equals PM10. A PTE of 0.30 tpy of $PM_{2.5}$ is estimated. The particulate emissions are controlled by the water blanket that covers the plasma cutting. The identified control technologies are listed on Table 2, including the currently implemented plasma gas selection and manufacture recommendations on water submersion techniques.

The technical feasibility evaluation showed that potential additional controls could include best management practices (BMPs) on water submerging, flex duct capture system with HEPA, ESP, and fume hood with fabric filters. The safety and process flow would be critically disrupted with the hoist and carry technologies if a capture system was installed. Therefore, these additional technologies are considered technically infeasible.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for the plasma cutter is considered to be the current controls: plasma gas selection and following manufacture recommendations on water submersion techniques. A manufacturer's inspection and implementation of BMPs could help minimize emissions.

3.6.2 NOx

The wet plasma cutter at NBS also produces NOx emissions. The identified control technologies for NOx are listed on Table 4, including the currently implemented plasma gas selection and manufacture recommendations on water submersion techniques.

The technical feasibility evaluation showed that potential additional control included additional BMPs such as a flex duct capture system with wet or dry scrubbers, a non-selective catalytic reduction (NSCR), selective catalytic reduction (SCR). A re-evaluation of the operation and current settings (e.g., lowest recommended current, arc voltage, and arc length, travel speed and additional training on proper angle) was also identified as BACT in our literature research. A wet plasma manufacturer' representative professional evaluation would be required to determine if re-evaluating the settings would decrease emissions. The safety and process flow would be critically disrupted with the hoist and carry system if a capture system was installed. There is no flue to inject urea for the NSCR or SCR. Therefore, these additional technologies are considered technically infeasible. The BACT for the wet plasma cutter should be considered the currently implemented plasma gas selection and manufacture recommendations on water submersion techniques.

3.7 PLASMA CUTTER (STRUCTURAL PRODUCTS - WET)

3.7.1 $PM_{2.5}$

A new wet plasma cutter will be installed in the Structural Products section of the Joist Plant. The particulate emissions are controlled by the water blanket that covers the plasma cutting.

The uncontrolled $PM_{2.5}$ PTE is estimated to be 0.03 tpy. The existing wet blanket technique results in a 95% reduction in emissions. Additional controls would result in insignificant amounts of $PM_{2.5}$ removal, thus making additional controls technically and economically infeasible. .

Therefore, BACT for the plasma cutter is considered to be the current controls: plasma gas selection and following manufacture recommendations on water submersion techniques.

See Section 3.6.1.

3.7.2 NOx

See Section 3.6.2.

3.8 PLASMA CUTTER (STRUCTURAL PRODUCTS - DRY)

3.8.1 $PM_{2.5}$

Nucor-Vulcraft is installing a dry plasma cutter for the Structural Products line. This source produces $PM_{2.5}$ emissions. The identified control technologies are listed on Table 2, including the currently implemented fume collector and control (blended cellulose and polyester fibers).

The technical feasibility evaluation showed that potential additional control technologies include additional BMPs such as a flex duct capture system with HEPA, ESP, or fume collector, improved filter efficiency (i.e., dry filtration), and re-evaluating the settings (e.g., lowest recommended current, arc voltage, and arc length, travel speed and additional training on proper angle). An expert evaluation would be required to determine if re-evaluating the settings would decrease emissions. The safety and process flow would be critically disrupted with the hoist and carry system if a capture system was installed. There is no flue to inject urea for the NSCR or SCR. Therefore, these additional technologies are considered technically infeasible.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for the plasma cutter is considered to be the current controls: using a fume collector and control.

3.8.2 NOx

The dry plasma cutter in Structural Products also produces NOx emissions. The identified control technologies are listed on Table 5, including the currently implemented fume collector and control.

The technical feasibility evaluation showed that potential additional control technologies include a flex duct capture system with wet or dry scrubbers. The safety and process flow would be critically disrupted with the hoist and carry system if a capture system was installed. Therefore, these additional technologies are considered technically infeasible.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for the plasma cutter is considered to be the current controls: using a fume collector and control.

3.9 BRIDGING LINE (SPRAY BOX)

3.9.1 $PM_{2.5}$

Nucor-Vulcraft operates a Bridging Line that produces direct $PM_{2.5}$ emissions. The identified control technologies are listed on Table 2, including best management practices.

The technical feasibility evaluation showed one potential additional control technology: fabric filter. However, the majority of particle matter created from the Spray Box is greater than 2.5 µm. The Spray Box is a self-contained chamber that coats parts along the production line. Although $PM_{2.5}$ emissions have been calculated, the presences of $PM_{2.5}$ at this operation are highly unlikely. Effective control of non-existent $PM_{2.5}$ emissions therefore is technically infeasible.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for the bridging line is considered to be the current controls: best management practices.

3.9.2 VOCs

The Bridging Line spray box produces VOC emissions. The identified control technologies are listed on Table 5, including replacing the vacu-coater with the spray box in the NOI submittal dated February 9, 2017 and reducing the paint VOC content to 2.1 lb/gal.

The technical feasibility evaluation showed no additional control technologies were feasible for the spray box.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for the spray box is considered to be the current controls: replacement of vacu-coater and the reduction of VOC content to 2.1 lb/gal.

3.10 WELDING

3.10.1 $PM_{2.5}$

Nucor-Vulcraft performs welding operations. This source produces $PM_{2.5}$ emissions. The identified control technologies are listed on Table 2, including the currently implemented inert shielding gas, the electrode selection, and using lowest recommended current/low amperes (AMPs).

The technical feasibility evaluation showed that potential additional control technologies include additional BMPs such as a flex duct capture system with HEPA or ESP, a torch fume extraction HEPA or ESP, and re-evaluating the settings (e.g., lowest recommended current, arc voltage, and arc length, travel speed and additional training on proper angle). An expert evaluation would be required to determine if re-evaluating the settings would decrease emissions. The safety and process flow would be critically disrupted with the hoist and carry system if a capture system was installed. Therefore, these additional technologies are considered technically infeasible.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for welding is considered to be the current controls: using an inert shielding gas, the electrode selection, and using the lowest recommended current/low AMPs.

3.11 SPRAY BOOTH (NBS - BUILT UP LINE)

3.11.1 $PM_{2.5}$

The PTE for $PM_{2.5}$ is based on the same emission factor as PM10, along with the control efficiency of the existing fabric filters. Given the existing fabric filters are estimated to control $PM_{2.5}$ by 95%, the estimated production of $PM_{2.5}$ from spray painting operations is due to the lack of quality emission factors. As estimated, NBS will produce a maximum of 1.87 tpy of $PM_{2.5}$.

Table 2 lists the identified control technologies for Direct $PM_{2.5}$ including, high-efficiency filter technology. This includes baghouses, cartridge, and fabric filters. However, the characteristics of spray painting and the associated overspray results in large diameter droplets that would immediately clog higher efficiency filter media.

The technological feasibility along with the non-effectiveness of reducing perceived $PM_{2.5}$ makes further controls not implementable. Therefore, BACT for the spray booth is considered the currently implemented use of high volume low pressure (HVLP) spray guns and 95% efficient filter pads.

3.11.2 VOCs

The identified control technologies for the control of VOCs from spray painting operations are carbon adsorption and TO technologies (Table 5). Carbon Adsorption requires a higher concentration of VOCs for this technology to be both cost effective and technically effective. Space restraints on the manufacturing floor also need to be considered for the carbon canisters associated with carbon adsorption.

The technical feasibility evaluation showed that TO technology is a viable consideration for spray painting operations. VOC PTE is estimated at 55.1 tpy for NBS and 17.8 tpy for Structural Products. TO technology could reduce VOC emission by more than 95%.

Feasibility of implementing this technology must consider the number of TO units, the extensive duct work and air movers and the large amount of natural gas that would be required for proper combustion. Environmental feasibility must consider that over 380 pounds of criteria pollutants would be produced for every million cubic feet of natural gas combusted, or that for every pound of VOC destroyed, 0.5 pounds of criteria pollutants are produced.

Economic feasibility evaluation shows that the incremental cost effectiveness exceeds $68,000 per ton destroyed at the NBS booth. Therefore, BACT should be considered the currently implemented lower VOC paints being used; work practice standards to limit the amount of overspray, and HVLP spray painting technology.

3.12 *SPRAY BOOTH (STRUCTURAL PRODUCTS)*

3.12.1 *$PM_{2.5}$*

The PTE for $PM_{2.5}$ is based on the same emission factor as PM10, along with the control efficiency of the existing fabric filters. Given the existing fabric filters are estimated to control $PM_{2.5}$ by 95%, the estimated production of $PM_{2.5}$ from spray painting operations is due to the lack of quality emission factors. As estimated, 1.0 tpy of $PM_{2.5}$ could be emitted from Structural Products' spray booth.

Table 2 lists the identified control technologies for Direct $PM_{2.5}$ including, high-efficiency filter technology. This includes both baghouse, cartridge and fabric filters. However, the characteristics of spray painting and the associated overspray results in large diameter droplets that would immediately clog higher efficiency filter media.

The technological feasibility along with the non-effectiveness of reducing perceived $PM_{2.5}$ makes further controls not implementable. Therefore, BACT should be considered the currently implemented use of HVLP spray guns and 95% efficient filter pads.

3.12.2 *VOCs*

The identified control technologies for the control of VOCs from spray painting operations are carbon adsorption and TO technologies (Table 5). Carbon Adsorption requires a higher concentration of VOCs for this technology to be both cost effective and technically effective. Space restraints on the manufacturing floor also need to be considered for the carbon canisters associated with carbon adsorption.

The technical feasibility evaluation showed that TO technology is a viable consideration for spray painting operations. VOC PTE is estimated at 17.8 tpy for Structural Products. TO technology could reduce VOC emission by more than 95%.

Feasibility of implementing this technology must consider the number of TO units, the extensive duct work and air movers and the large amount of natural gas that would be required for proper combustion. Environmental feasibility must consider that over 380 pounds of criteria pollutants would be produced for every million cubic feet of natural gas combusted or that for every pound of VOC destroyed, 0.5 pounds of criteria pollutants are produced.

Economic feasibility evaluation shows that the incremental cost effectiveness exceeds $246,000 at structural parts, exceeding the $10,000 threshold. Therefore

BACT should be considered the lower VOC paints being used; work practice standards to limit the amount of overspray, and HVLP spray painting technology.

3.13 DRYING OVENS (JOIST PLANT, NBS, STRUCTURAL PRODUCTS)

3.13.1 $PM_{2.5}$

Nucor-Vulcraft operates drying ovens in the Joist Plant, NBS, and Structural Products that produces $PM_{2.5}$ emissions. The identified control technologies are listed on Table 2, including currently used flue gas recirculation emission control.

The technical feasibility evaluation showed that potential additional control technologies for the drying oven include a capture system. This oven is designed to pass the steel products through the heating elements at a slow rate via overhead crane. Capture systems are not feasible due to the movement and weight of the products being processed.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for the drying oven in Joist Plant is considered to be the current control: flue gas recirculation.

3.13.2 SOx

The drying ovens are natural gas fired using pipeline quality natural gas. Other potential control technologies include a wet scrubber and a capture system with a flue gas desulphurization (Table 3). However, the amount of SOx emitted for the entire facility is <0.02 tpy. Therefore, the additional control technologies are considered technically and economically infeasible.

3.13.3 NOx

The drying ovens produce NOx emissions. The identified control technologies are listed on Table 4, including currently used flue gas recirculation emission control.

The technical feasibility evaluation showed that potential additional control technologies for the drying oven including SCR/SNCR and a LNB. However, to implement these would produce unacceptable safety and process mechanism issues, and they are therefore technically infeasible.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for the drying oven in Joist Plant is considered to be the current controls: flue gas recirculation.

3.13.4 VOC

The drying ovens produce VOC emissions. The identified control technologies are listed on Table 5, including currently used flue gas recirculation emission control.

The technical feasibility evaluation showed that additional control technologies for the drying oven include capture systems, except for the Purlin Line. To implement add-on controls would produce unacceptable safety and process mechanism issues, and therefore are technically infeasible.

The Purlin Line oven receives freshly painted beams and it is estimated that 90% of the VOC emissions are released during the baking process. The Purlin oven is already equipped with ducts that exhaust combustion and paint emissions to ambient air. Please see Section 3.20 for further discussion on controls.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for the drying oven in the Joist Plant is considered to be the current controls: flue gas recirculation.

3.13.5 NH_3

Ammonia emissions are not of concern because of insignificant emission rates from the Nucor-Vulcraft facility (Table 6).

3.14 FUGITIVE SPRAY

3.14.1 $PM_{2.5}$

The ability to paint 2% of the production was requested in the recent NOI submittal dated 9 February 2017. As the fugitive spray emissions are less than 1 tpy of direct $PM_{2.5}$, no BACT technologies were identified.

3.14.2 VOCs

The ability to paint 2% of the production was requested in the recent NOI submittal dated February 9, 2017. As the fugitive spray emissions are less than 0.4 tpy of VOC, no BACT technologies were identified.

3.15 *HAUL ROADS (NBS)*

3.15.1 *$PM_{2.5}$*

Nucor-Vulcraft has both paved and unpaved haul roads that produce direct $PM_{2.5}$ emissions. The identified control technologies are listed on Table 2, including the currently implemented 10 mph speed limit, vacuum sweeping, and water dust suppression.

The technical feasibility evaluation identified one potential additional control technology for haul roads: quarterly chemical treatment. However, UDAQ adopted chemical treatment emission factors that will not result in documented lower emissions. This technology is therefore considered technically and economically infeasible.

Paving additional areas that experience heavy traffic may reduce the amount of dust particulate matter. However, the total $PM_{2.5}$ emissions are less than 0.2 tpy. Therefore no additional BACT technologies were identified.

BACT for haul roads is considered to be the current controls: enforce 10 mph speed limit, vacuum sweeping, and water dust suppression.

3.16 *HAUL ROADS (JOIST PLANT)*

3.16.1 *$PM_{2.5}$*

Nucor-Vulcraft has both paved and unpaved haul roads that produce direct $PM_{2.5}$ emissions. The identified control technologies are listed on Table 2, including the currently implemented recent increase of paved road length, 10 mph speed limit, vacuum sweeping, and water dust suppression.

The technical feasibility evaluation showed that potential additional control technologies include vacuum sweeping on a more frequent basis and quarterly chemical treatment. However, these will not lower emissions and are therefore considered technically and economically infeasible.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for haul roads is considered to be the current controls: the recent increase of paved road length, 10 mph speed limit, vacuum sweeping, and water dust suppression.

3.17 RESISTANCE WELDING

3.17.1 $PM_{2.5}$

Nucor-Vulcraft uses resistance welding as a part of the Grating Line, which may produce direct $PM_{2.5}$ emissions. Nucor-Vulcraft could not identify any documentation on emission factors in order to quantify emissions from this process. Several resource documents indicate that resistance welding produces insignificant amounts of criteria pollutants. The identified control practice is listed on Table 2; this includes the currently implemented operation according to manufacturing specifications.

The technical feasibility evaluation showed that potential additional control technologies include a reevaluation to lower the current intensity. However, further evaluation beyond BACT would be required to determine if this would indeed lower emissions.

As no additional technologies were identified as technically feasible, no economic analysis was conducted. Therefore, BACT for resistance welding is considered to be the current control: operation according to manufacturing specifications.

3.18 PARTS CLEANERS (NBS, JOIST PLANT, COLD FINISH)

3.18.1 VOCs

Nucor-Vulcraft has parts cleaners in NBS, Joist Plant, and Cold Finish that produce VOC emissions. The identified control technologies are listed on Table 5 including the currently implemented replacement of Stoddard solvent with Safety-Kleen's Type II Solvent and the 2017 retirement of four parts cleaner units.

The technical feasibility evaluation showed one potential additional control for the parts cleaners: replace Safety-Kleen Type II solvent with extremely low VOC solvent solutions (e.g. citrus cleaner & degreaser). This replacement could decrease current emissions by a PTE estimated total of 0.171 tpy. To determine if this is technically feasible, testing various surface washing agents would need to be evaluated in these three areas (NBS, Joist Plant and Cold Finish) to determine the performance.

If surface washing agent can perform well enough to use, this would be considered BACT. Economic feasibility appears to be valid. However, until it can be tested, BACT is considered the current controls: using Safety-Kleen Type II solvent and the retirement of four parts cleaners.

3.19 *DIP COATING (JOIST PLANT, NBS)*

3.19.1 *VOCs*

Dip coating operations are performed at the Joist Plant, truss painting equipment, Structural Parts line, NBS and at the Accessory Dip Tank. The weight and irregular shape(s) of many of the truss, beams, rods, structures, etc., (e.g. "parts") to be painted, require dip coating as opposed to spray booth painting. The existing tanks at the facility are long narrow structures, deep enough to submerge a given part. The rate of VOC emissions are based on the VOC content of the paint, the surface area of the parts being painted, and the surface area of the tank's liquid surface. The dip tank process has no energy inputs (i.e. fuel or electricity) so the process does not have a start up or shut down period. By operation, these emissions are fugitive.

The identified control technologies for VOC mitigation are listed on Table 5 and are discussed below. Thermal oxidation (TO) technologies have been implemented for large metal painting operations and the control of VOCs. Up to 95% control has been achieved using TO. Carbon Adsorption requires a higher concentration of VOCs for this technology to be both cost effective and technically effective.

The technical feasibility evaluation showed that TO technologies determined to be economically infeasible with incremental cost effectiveness ratios exceeding:

- $143,800 to $252,700 per ton of VOC removed for the Joist Plant painting operations; and

- $40,300 to $70,500 per ton of VOC removed for the NBS painting operations.

Collecting these fugitive VOCs while maintaining functional operations is one of the main drivers for the high estimated cost.

Work practice standards to control VOC emissions currently consist of the tank lids placed back on the tank at the end of each shift and placed back on the tank during the shift if the dip tanks will not be used for one hour or more. Additional work practice standards have reduced emissions because this facility does not offer or provide specialty painting of parts or second/finishing coats.

A significant reduction in VOC emissions has occurred during the last 15 years through Nucor-Vulcraft's use of lower VOC paints (i.e., water based paints) that provide the needed attributes for steel structures and parts while reducing VOC concentrations. Since 2005, annual VOC emissions at the facility have been reduced, mainly from painting operations, from 339 tons to 262 tpy based on the 9 February 2017 PTE calculations. Nucor-Vulcraft experienced an average increase of $4 per gallon to use the low-VOC paint compared to the prior VOC-based paints, which results in an additional annual cost of about $900,000 per year based on the average annual quantities of paint used.

3.20 VACU-COATER (NBS - PURLIN LINE)

The Purlin Line (secondary structural components) production line has a vacu-coater that provides a protective layer of paint onto the horizontal beams. The vacu-coater applies the paint on moving beams and then the beam immediately enters the Purlin oven.

Purlin coating is a specialty type of painting that cannot be achieved with spray booths or dip tanks.

As estimated for PTE purposes, the paint applied from the vacu-coater produces up to 33 tpy of VOC emissions. This is based on 1.7 gallons of paint applied per ton of steel, and 2.1 pounds of VOCs per gallon of paint, and 31,475 gallons of paint used at the Purlin Line.

However, actual current emissions from the Purlin Line operation are significantly lower than the PTE estimated values. Actual data show that the painting efficiency is correct at 1.7 gallons of paint per ton of steel; however, the paint at the Purlin Line has lower VOC content at 1.1 pounds of VOC per gallon of paint, and paint usage averaged only of 13,600 gallons. This results in an actual emission rate for VOCs of 9.3 tons per year.

The identified control technologies for VOCs are listed on Table 5. The identified additional control technologies, besides the already implemented low VOC paints, include scrubbers, carbon adsorption and various applications of thermal oxidation (TO). The technical feasibility evaluation showed that two control technologies to be technically implementable: wet scrubber and carbon adsorption. The characteristics of TO technology result in spatial and safety issues due to limited space, plumbing in a natural gas line and ignition sources. Employing TO technology will also create a half ton of pollutants for every ton of VOC removed. Therefore, TO technology is considered infeasible due to space limitations and safety and environmental issues.

Recent advances in wet, packed-tower, scrubbing units for the removal of VOCs might be technically and economically feasible. Further on site studies would have to be conducted to determine if the VOCs produced at the purlin line are soluble enough for wet scrubbing to be effective.

Carbon adsorption systems may also be technically feasible but the limited floor space available is a concern. Either a series of 55-gallon drums or a Carbtrol Hi-Flow G-14-PPL may be a functional control technology for this system.

An evaluation of these technologies shows that either control technology could be installed immediately following the Purlin vacu-coater. The Purlin oven already is equipped with exhaust ducts that are estimated to capture 90% of the paint VOCs and combustion gases from the oven. The construction of an augmented collection system would be possible. Existing exhaust fans/ducts could be plumbed to a control unit.

The BACT economic analyses results in an economic feasibility ratio for the carbon adsorption control at approximately $12,000 per ton of VOC removed, and the wet scrubber control at approximately $14,000 per ton of VOC removed.

Nucor-Vulcraft has already significantly reduced the VOC impact from this operation by implementing operational and raw material (painting) practices. Implementation included the following:

- Painting efficiency of 1.7 gallons of paint per ton of steel throughput; and
- VOC content of paint averaging 1.1 pounds of VOC per gallon of paint.

These voluntary operational parameters lead to significant and actual reductions. The main benefit is that it controls VOC emissions at the source. Past estimates assume VOCs are emitted either during application process (10%) or in the oven (90%). Actually, fugitive VOC emissions occur as soon as the container of paint is opened until final drying of the Purlin Line product in the yard. Controlling the amount of VOCs that can be emitted is a more effective means for actual VOC reductions, and these operational controls are considered BACT for this operation without further equipment controls.

3.21 MASTIC EQUIPMENT

3.21.1 VOCs

Mastic Equipment is used in NBS on the Standing Seam line. A rust preventer is applied along the moving production line. The VOC content of the material averages 1.75 pounds per gallon. The capture system for the VOCs would have to extend along the line to capture the continuous evaporation of the mastic. Control technologies were not identified for this application, although typical VOC control techniques likely should be considered. As previously discussed, carbon adsorption requires a more concentrated captured VOC stream and TO technology will require additional natural gas usage. Natural gas combustion to control the VOCs will create 0.5 tons of criteria pollutants and GHGs for every million cubic feet of natural gas flow. No control technologies were identified as future product development would be required.

3.22 LUBRICATION EQUIPMENT

3.22.1 VOCs

A highly evaporative lubricant is used to protect the finish of some of the panels in the NBS side panels. Calculations assume 100 % of the oil used evaporates as VOCs (7 lb/gal). A liberal calculation, using just over 2,600 gallons of lubricant, is used to estimate VOC emissions at 9.2 tpy. For actual usage, the amount of emissions and volume of emissions is much less than calculated.

The technical feasibility of this approach appears not to be implementable due to challenges of collecting emissions along the entire production line (emissions continue to emit long after application) and the potential safety hazards of collecting and oxidizing the emissions.

4.0 BACT RECOMMENDATIONS

Based on the UDAQ expectation that BACT be defined as control technologies that could be installed and made operational by the end of 2018, Nucor-Vulcraft has determined that baseline conditions represent BACT for practically all emission sources. The enhanced use of low-VOC paints during the past 15 years is considered BACT for the painting operations, which has reduced VOC emissions from 339 tons to 262 tons per year (tpy). In addition, Nucor-Vulcraft proposes to evaluate welding techniques and plasma cutter operations, to confirm if techniques are optimal to ensure that emissions are minimized.

The emission limits and monitoring outlined in the 9 February 2017 NOI take into account the continuous reduction in emissions being achieved at Nucor-Vulcraft and are believed to represent BACT for the facility with the amendments acknowledged herein.

Tables

Table 1 *BACT Selection for each Pollutant by Source*

Source	$PM_{2.5}$	SOx	NOx	VOC	NH_3
Wire Line Shot Blasting	Currently implemented: Baghouse 99.99% efficiency				
Coil Line Shot Blasting	Currently implemented: Baghouse with 98% efficiency				
Bar Line Shot Blasting	Currently implemented: Baghouse with 98% efficiency				
Exhaust Vents (Joist Plant)					
Exhaust Vents (Cold Finish)					
Plasma Cutter (Cold Finish – Dry)	Currently implemented: Limited use, BMPs		Currently implemented: Limited use, BMPs		
Plasma Cutter (NBS – Wet)	Currently implemented: Plasma gas selection, follow manufacture recommendation on water submersion techniques		Currently implemented: Plasma gas selection, follow manufacture recommendation on water submersion techniques		
Plasma Cutter (Structural Products – Wet)	Same as NBS-Wet		Same as NBS-Wet		
Plasma Cutter (Structural Products – Dry)	Currently implemented: Fume collector and control		Currently implemented: Fume collector and control		
Bridging Line (Spray Box)	Currently implemented: BMPs			Currently implemented: Replacement of vacu-coater, reduce VOC content to 2.1 lb/gal	
Welding	Currently implemented: Inert shielding gas, electrode selection, lowest recommended current/low AMPs				

Source	$PM_{2.5}$	SOx	NOx	VOC	NH_3
Spray Booth (NBS – Built up Line)	Currently implemented: HVLP spray guns, high efficiency filter system		Currently implemented: HVLP spray guns, reduce VOC content to 2.1 lb/gal, high efficiency filter system		
Spray Booth (Structural Products)	Same as NBS		Same as NBS		
Drying Oven (Joist Plant)	Currently implemented: FGR	Currently implemented: NG fired using pipeline quality NG	Currently implemented: FGR	Currently implemented: FGR	Insignificant emission rate
Drying Oven (NBS)	Same as Joist Plant	Same as Joist Plant	Same as Joist Plant	Same as Joist Plant	Same as Joist Plant
Drying Oven (Structural Products)	Same as Joist Plant	Same as Joist Plant	Same as Joist Plant	Same as Joist Plant	Same as Joist Plant
Fugitive Spray Booth	Currently implemented: No more than 2% will be sprayed outside the booth			Currently implemented: No more than 2% will be sprayed outside the booth	
Haul Roads (NBS)	Currently implemented: Water dust suppression, speed limit, vacuum sweeping				
Haul Roads (Joist Plant)	Currently implemented: Increase paved road length, water dust suppression, speed limit, vacuum sweeping				
Resistance Welding	Currently implemented: Operating according to manufacturing specifications				
Parts Cleaners (NBS)				Test Simple Green	
Parts Cleaners (Joist Plant)				Same as NBS	

Source	$PM_{2.5}$	SOx	NOx	VOC	NH_3
Parts Cleaners (Cold Finish)				Same as NBS	
Dip Coating				Currently implemented: Reduce VOC content to 2.1 lb/gal, Cover tanks when not in use	
Joist Coating				Currently implemented: Reduce VOC content to 2.1 lb/gal	
Vacu- Coater (NBS - Purlin Line)				Currently implemented: Operational controls	
Accessory Dip Tanks				Same as Joist Coating	
Mastic Equipment				Future Product development needed	
Lubrication Equipment				Same as Mastic Equipment	

Table 2 *Potential BACT Technologies for Direct $PM_{2.5}$ – Particulate Matter*

Source / Process Area	Existing Control Technology	Potential Control Technologies	Potential Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
Wire Line Shot blasting [A]	Wire Line Baghouse - 99.99% down to 0.5*u*m.		Y	Currently implemented	N/A	N/A
Coil Line Shot blasting [A]	Baghouse w/ 98% removal		Y	Currently implemented	N/A	N/A
		Filter media = 99.99% down to 0.5 *u*m	Y		0.07	$767,044
Bar Line Shot blasting [A]	Bar Line Baghouse 98%		Y	Currently implemented	N/A	N/A
		Filter media = 99.99% down to 0.5 *u*m	Y		0.19	$263,671
Joist Plant Building- Roof Exhaust Vents 6 + 9 roof exhaust vents		Scrubber	N	Vents would have to be retrofitted with support structures	N/A	N/A
		HEPA	N	Blower fans on roof at each roof exhaust or extensive duct system plumbing into one HEPA	N/A	N/A
		ESP	N	Works best on high and wet particles; large space requirements, not applicable to other pollutants and high operating cost	N/A	N/A
Cold Finish Building (Roof Exhaust Vents) 2 roof exhaust vents		Scrubber	N	Vents would have to be retrofitted with support structures	N/A	N/A
		HEPA	N	Blower fans on roof at each roof exhaust or extensive duct system plumbing into one HEPA	N/A	N/A

Source / Process Area	Existing Control Technology	Potential Control Technologies	Potential Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
		ESP	N	Works best on hot and wet particles; large space requirements, not applicable to other pollutants and high operating cost	N/A	N/A
Plasma Cutter (Cold Finish - Dry)	Limited Use; BMPs		Y	Currently implemented	N/A	N/A
Plasma Cutter (Structural Parts - Dry)	Fume collector and control (blended cellulose and polyester fibers)		Y	Currently implemented	N/A	N/A
		Flex duct Capture system with HEPA, ESP, or fume collector	N	Safety and process flow would be critically disrupted with hoist and carry system.	N/A	N/A
		Improved filter efficiency (i.e. Dry Filtration)	N	Safety and process flow would be critically disrupted with hoist and carry system.		
		Re-evaluate lowest recommended current, arc voltage, and arc length. Reevaluate travel speed and additional training on proper angle	Y	Expert evaluation required	N/A	N/A
Plasma Cutter (NBS-Wet)	Plasma Gas Selection		Y	Currently implemented	N/A	N/A
	Follow Manufacture recommendation on water submersion techniques		Y	Currently implemented	N/A	N/A

Source / Process Area	Existing Control Technology	Potential Control Technologies	Potential Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
		Additional BMPs on Water Submerging (i.e. Re-evaluate optimal distance between tip and workpiece, correct tip, amperage setting, cutting speed, and material exit angle.)	Y	Expert evaluation required	N/A	N/A
		Flex Duct Capture System with HEPA or ESP	N	Safety and process flow would be critically disrupted with hoist and carry system.	N/A	N/A
		Fume Hood with fabric filters (i.e. dry filtration)	N	Safety and process flow would be critically disrupted with hoist and carry system		
Plasma Steel Cutter (Structural Products -Wet)	Plasma Gas Selection		Y	Currently implemented	N/A	N/A
	Follow Manufacture recommendation on water submersion techniques		Y	Currently implemented	N/A	N/A
		Flex Duct Capture System with HEPA or ESP	N	Safety and process flow would be critically disrupted with hoist and carry system.	N/A	N/A
		BMPs on Water Submerging (i.e. Re-evaluate optimal distance between tip and workpiece, correct tip, amperage setting, cutting speed, and material exit angle)	Y	Expert evaluation required	N/A	N/A

Source / Process Area	Existing Control Technology	Potential Control Technologies	Potential Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
		Fume Hood with fabric filters (i.e. dry filtration)	N	Safety and process flow would be critically disrupted with hoist and carry system.		
Bridging Line (Spray box) A	BMPs		Y	Currently implemented	N/A	N/A
		Fabric Filter	N	Majority of PM > 2.5um	N/A	N/A
Welding	Inert Shielding Gas		Y	Currently implemented	N/A	N/A
	Electrode Selection		Y	Currently implemented	N/A	N/A
	Lowest Recommended Current/ Low AMPs		Y	Currently implemented	N/A	N/A
		1.Flex Duct Capture System HEPA or ESP	N	Safety and process flow would be critically disrupted with hoist and carry system.	N/A	N/A
		2.Torch Fume Extraction HEPA or ESP	N	Safety and process flow would be critically disrupted with hoist and carry system.	N/A	N/A
		3. Re-evaluate lowest recommended current, arc voltage, and arc length. Reevaluate travel speed and additional training on proper angle	Y	Experts required	N/A	N/A
Spray booth (NBS - Built up Line)	Source Control: HVLP spray guns		Y	Currently implemented	N/A	N/A
	Exhaust Control: 95% Filter Pads		Y	Currently implemented	N/A	N/A

Source / Process Area	Existing Control Technology	Potential Control Technologies	Potential Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
		Fabric Filter / Baghouse	N	Characteristics of spray painting and the associated overspray results in large diameter droplets that would immediately clog filter media	N/A	N/A
Spray booth (Structural Products)	Source Control: HVLP spray guns		Y	Currently implemented	N/A	N/A
	Exhaust Control: 95% Filter Pads		Y	Currently implemented	N/A	N/A
		Fabric Filter / Baghouse	N	Characteristics of spray painting and the associated overspray results in large diameter droplets that would immediately clog filter media	N/A	N/A
Drying ovens (Joist Plant)	Flue gas recirculation emission control		Y	Currently implemented	N/A	N/A
		Capture Systems	N	Safety and process flow would be critically disrupted with hoist and carry system.	N/A	N/A
Drying Oven (NBS)	Flue gas recirculation emission control		Y	Currently implemented	N/A	N/A
		Capture Systems	N	Safety and process flow would be critically disrupted with hoist and carry system.	N/A	N/A
Drying Oven (Structural Parts)	Flue gas recirculation emission control		Y	Currently implemented	N/A	N/A
		Capture Systems	N	Safety and process flow would be critically disrupted with hoist and carry system.	N/A	N/A
Fugitive Spray Booth	-	-	-	2% of the production will be allowed to be painted outside the paint booth. Total emissions <1 tpy.	N/A	N/A
Haul Roads (NBS) [1]	Increased paved road length		N	Total emissions <0.2 tpy	N/A	N/A

Source / Process Area	Existing Control Technology	Potential Control Technologies	Potential Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
	10 mph Speed limit		Y	Currently implemented	N/A	N/A
	Vacuum Sweeping for paved areas on a monthly basis		Y	Currently implemented	N/A	N/A
	Water dust suppression		Y	Currently implemented	N/A	N/A
		Quarterly Chemical treatment	N	Does not lower emissions[2]	N/A	N/A
Haul Roads (Joist Plant)[1]	Increased paved road length		Y	Currently implemented	N/A	N/A
	Water dust suppression		Y	Currently implemented	N/A	N/A
	10 mph Speed limit		Y	Currently implemented	N/A	N/A
	Vacuum Sweeping		Y	Currently proposed as an "on as needed basis"	N/A	N/A
		Vacuum Sweeping on more frequent basis	N	Does not lower emissions[2]	N/A	N/A
		Quarterly Chemical treatment	N	Does not lower emissions[2]	N/A	N/A
Resistance Welding	Operating according to Manufacturing Specifications		Y	<0.1 *um*	N/A	N/A
		Reevaluate lower current intensity	Y	Expert	N/A	N/A

Notes:

1) Most particulate size >2.5

2) https://deq.utah.gov/Permits/air/docs/2015/01Jan/EmissionPavedUnpavedHaulRoads.pdf

Table 3 *Potential BACT Technologies for SOx – Sulfur Oxides*

Source / Process Area	Existing Control Technology	Potential Control Technologies	Technically Feasible? (Y / N)	Comments	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
Drying Oven (Joist Plant)	Natural Gas Fired using pipeline quality NG.		Y	<0.02 tpy	N/A	N/A
		Wet Scrubbing	N	Very little SOx to remove	N/A	N/A
		Capture Systems with FGD (Flue gas desulphurization)	N	Very little SOx to remove	N/A	N/A
Drying Oven (NBS)	Natural Gas Fired using pipeline quality NG.		Y	<0.02 tpy	N/A	N/A
		Wet Scrubbing	N	Very little SOx to remove	N/A	N/A
		Capture Systems with FGD (Flue gas desulphurization)	N	Very little SOx to remove	N/A	N/A
Drying Oven (Structural Parts)	Natural Gas Fired using pipeline quality NG.		Y	<0.02 tpy	N/A	N/A
		Capture Systems with FGD (Flue gas desulphurization)	N	Very little SOx to remove	N/A	N/A
		Wet Scrubbing	N	Very little SOx to remove	N/A	N/A

Table 4 Potential BACT Technologies for NOx – Nitrogen Oxides

Source / Process Area	Existing Control Technology	Potential Control Technologies	Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
Plasma Cutter (Cold Finish - Dry)	Limited Use		Y	Currently Implemented	N/A	N/A
		Flex duct Capture system with HEPA, ESP, or fume collector	N	Dry Plasma Cutter operation is sporadic and results in insignificant emissions	N/A	N/A
Drying Oven (Joist Plant)	Flue gas recirculation emission control		Y	Currently Implemented	N/A	N/A
		SCR/SNCRs	N	Hoist and process mechanism issues	N/A	N/A
		Low NOx Burner	N	Hoist and process mechanism issues	N/A	N/A
Drying Oven (NBS)	Flue gas recirculation emission control		Y	Currently Implemented	N/A	N/A
		SCR/SNCRs	N	Hoist and process mechanism issues	N/A	N/A
		Low NOx Burner	N	Hoist and process mechanism issues	N/A	N/A
Drying Oven (Structural Parts)	Flue gas recirculation emission control		Y	Currently Implemented	N/A	N/A
		SCR/SNCRs	N	Hoist and process mechanism issues	N/A	N/A
		Low NOx Burner	N	Hoist and process mechanism issues	N/A	N/A
Plasma Steel Cutter (Structural	Plasma Gas Selection		Y	Currently Implemented	N/A	N/A

Source / Process Area	Existing Control Technology	Potential Control Technologies	Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
Products -Wet)	Follow Manufacture recommendation on water submersion techniques		Y	Currently Implemented	N/A	N/A
		Flex Duct Capture System with Wet Scrubbers	N	Hoist and process mechanism issues	N/A	N/A
		Flex Duct Capture System with Dry Scrubbers	N	Hoist and process mechanism issues	N/A	N/A
		Non-Selective Catalytically Reduction (NSCR)	N	No flue to inject urea	N/A	N/A
		Selective Catalytically Reduction (SCR)	N	No flue to inject urea	N/A	N/A
		Re-evaluate optimal distance between tip and workpiece, correct tip, amperage setting, cutting speed, and material exit angle.	Y	Expert evaluation required	N/A	N/A
Plasma Steel Cutter (NBS - Wet)	Plasma Gas Selection		Y	Currently Implemented	N/A	N/A
	Follow Manufacture recommendation on water submersion techniques		Y	Currently Implemented	N/A	N/A

Source / Process Area	Existing Control Technology	Potential Control Technologies	Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
		Flex Duct Capture System with Wet Scrubber System	N	Hoist and process mechanism issues	N/A	N/A
		Flex Duct system with Dry Scrubbing	N	Hoist and process mechanism issues	N/A	N/A
		Re-evaluate optimal distance between tip and workpiece, correct tip, amperage setting, cutting speed, and material exit angle.	Y	Expert evaluation required	N/A	N/A
		Non-Selective Catalytically Reduction (NSCR)	N	No flue to inject urea	N/A	N/A
		Selective Catalytically Reduction (SCR)	N	No flue to inject urea	N/A	N/A
Plasma Cutter (Structural Products -Dry)	Fume collector and control		Y	Currently Implemented	N/A	N/A
		Flex Duct Capture System with Wet Scrubber System	N	Hoist and process mechanism issues	N/A	N/A
		Flex Duct system with Dry Scrubbing	N	Hoist and process mechanism issues	N/A	N/A

Table 5 Potential BACT Technologies for VOCs – Volatile Organic Compounds

Source / Process Area	Existing Control Technology	Potential Control Technologies	Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
Parts Cleaners (NBS)	Retired 4 from NBS; Replace Stoddard solvent with Safety-Kleen		Y	Currently Implemented	N/A	N/A
		Replace Safety-Kleen with Simple Green	Y		0.06	-
Parts Cleaners (Joist Plant)	Replace Stoddard solvent with Safety-Kleen		Y	Currently Implemented	N/A	N/A
		Replace Safety-Kleen with Simple Green	Y		0.071	-
Parts Cleaners (Cold Finish)	Replace Stoddard solvent with Safety-Kleen		Y	Currently Implemented	N/A	N/A
		Replace Safety-Kleen with Simple Green	Y		0.04	-
Dip Coating	Paint VOC content reduced to 2.1 lb/gal		Y	Currently Implemented	N/A	N/A
	Covering dip tanks when not in use		Y	Currently Implemented	N/A	N/A
		Capture System with Thermal Oxidization	Y		114	$40,300 - $252,700
		Capture System with Carbon Adsorption	N	Higher concentration of VOCs is required	N/A	N/A
Joist Coating	Paint VOC content reduced to 2.1 lb/gal		Y	Currently Implemented	N/A	N/A

Source / Process Area	Existing Control Technology	Potential Control Technologies	Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
Bridging Line (Spray box)	Replace vacu-coater; Paint VOC content reduced to 2.1 lb/gal		Y	Currently Implemented	N/A	N/A
Drying Oven (Joist Plant)	Flue gas recirculation emission control		Y	Currently Implemented	N/A	N/A
		Capture Systems	N	Safety and process flow would be critically disrupted with hoist and carry system.	N/A	N/A
Drying Oven (NBS)	Flue gas recirculation emission control		Y	Currently Implemented	N/A	N/A
		Capture Systems	N	Safety and process flow would be critically disrupted with hoist and carry system.	N/A	N/A
Drying Oven (Structural Parts)	Flue gas recirculation emission control		Y	Currently Implemented	N/A	N/A
		Capture Systems	N	Safety and process flow would be critically disrupted with hoist and carry system.	N/A	N/A
Spray Booth (NBS - Built up Line)	HVLP spray guns		Y	Currently Implemented	N/A	N/A
	Paint VOC content reduced to 2.1 lb/gal		Y	Currently Implemented	N/A	N/A
	High efficiency filter systems		Y	Currently Implemented	N/A	N/A
		Thermal Oxidization	Y		52.3	$68,000
		Carbon Adsorption	N	Higher concentration of VOCs is required	N/A	N/A

Source / Process Area	Existing Control Technology	Potential Control Technologies	Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
Spray Booth (Structural Products)	HVLP spray guns		Y	Currently Implemented	N/A	N/A
	Paint VOC content reduced to 2.1 lb/gal		Y	Currently Implemented	N/A	N/A
	High efficiency filter systems		Y	Currently Implemented	N/A	N/A
		Thermal Oxidization	Y		17.8	$68,000
		Carbon Adsorption	N	Higher concentration of VOCs is required	N/A	N/A
Flow Coater (NBS - Purlin Line)	Paint VOC content reduced to 1.1 lb/gal (paint specific to Purlin Line)		Y	Currently Implemented	N/A	N/A
		Thermal Oxidization	N	Space limitations, safety, and other environmental issues.	N/A	N/A
		Carbon Adsorption	Y		7.8	$12,000
		Wet Scrubber	Y		7.6	$14,000
Mastic Equipment				Future product development relevant	N/A	N/A
Lubrication Equipment				Future product development relevant	N/A	N/A
Fugitive Spray Booth				2% of the production will be allowed to be painted outside the paint booth. Total emissions <0.4 tpy.		

Table 6 Potential BACT Technologies for NH_3 – Ammonia

Source / Process Area	Existing Control Technology	Potential Control Technologies	Technically Feasible? (Y / N)	Comment	Incremental Emissions Reduction (TPY)	Incremental Cost Effectiveness ($/ton)
Drying Oven (Joist Plant)	Flue gas recirculation emission control			NH3 emissions are not of concern because of insignificant emission rate from this facility		
	Capture Systems			NH3 emissions are not of concern because of insignificant emission rate from this facility		
Drying Oven (NBS)	Flue gas recirculation emission control			NH3 emissions are not of concern because of insignificant emission rate from this facility		
	Capture Systems			NH3 emissions are not of concern because of insignificant emission rate from this facility		
Drying Oven (Structural Parts)	Flue gas recirculation emission control			NH3 emissions are not of concern because of insignificant emission rate from this facility		
	Capture Systems			NH3 emissions are not of concern because of insignificant emission rate from this facility		

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